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ACCESS

ATN Compliant Communications

European Strategy Study

AFTN/AMHS Gateway Conformance Testing Requirements

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DOCUMENT CONTROL LOG

Revision Number	Date	Description of Change
0.1	22 June 1998	first draft (originally issued as WP265, Version 0.1)
1.0	28 October 1998	revision of first draft based on experience in drafting WP271; further editorial changes; presented to Consortium for acceptance
1.1	26 November 1998	minor changes as a result of comments from NATS in the following sections: 2.4 (modification to 6th paragraph) 3.1.2 (modification to first bullet) 3.3 (additional bullet)

EXECUTIVE SUMMARY

Although part of ACCESS Phase 2, Part 2, “Interoperability Testing”, this report resulting from WP270 describes a different approach to testing AMHS components. “Conformance testing” is an activity, often performed in the laboratory and not in the network. It has its own methodology, strengths and weaknesses, and is considered by the ACCESS Consortium to be an important step in the realisation of the AMHS. .

The document highlights the distinctions which can be made between interoperability and conformance testing in general. It is shown that conformance testing is particularly relevant to the AFTN/AMHS Gateway with a possibly high cost/benefit ratio.

The AFTN/AMHS Gateway, as a component of the AMHS, is described briefly from the viewpoint of conformance testing. It is shown that, in particular, the conversion functions corresponding to the so-called “Message Transfer and Control Unit” are the ones which should be subject to conformance testing.

In order to make recommendations for conformance testing the AFTN/AMHS Gateway, conformance testing in two other contexts, OSI and CIDIN is described. The degree to which the testing should be able to “look into” the Gateway being tested is also considered. A discussion on the options from an organisational and equipment point of view provides further background.

Concerning the overall strategy, three sets of recommendations are made:

- organisational arrangements should foresee, amongst other things, testing being performed by individual equipment providers and States using a common set of test suites which are maintained centrally;
- the Gateway should be tested as a “black box” on its external interfaces only;
- the availability of common test equipment or at least equipment conforming to common specifications is desirable. A set of high level requirements placed on Gateway conformance testing equipment is given.

The following 5 sets of ensuing tasks are identified:

- refine methodology
- specify test suites
- create requirements specification for test equipment
- procure test equipment
- perform conformance tests

The first two of these are addressed in [A271].

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1 Introduction

1.1 Scope

This document is one of the deliverables of Phase 2, Part 2 of the ACCESS project. Phase 2, Part 2 is being performed under the title of "interoperability testing" of implementations of AMHS components - see [A260] for an overview of the overall approach and strategy. The ACCESS Consortium has decided to include some work here and in [A271] which is of a somewhat different nature and which cannot, strictly speaking, be classed as interoperability testing.

Interoperability testing is appropriate for the testing of systems which are composed of well-tried components but which are to be introduced into new or differently configured or profiled environments. This might be the case, for example, when a number of systems which are claimed to adhere to the same specifications but which are the result of different product developments need to interwork in one environment. This is true for the majority of the AMHS systems, with one significant exception: the AFTN/AMHS Gateway is a new system in many respects and cannot be claimed to be well tried.

The scope of this document is restricted to the conformance testing of implementations of the AFTN/AMHS Gateway as specified in [ICAO1]. Within this scope, the document concentrates on strategic goals and results expected from the conformance testing activity and requirements placed on it.

1.2 Purpose of Document

The principle purposes of the document are:

- provide enough background information to allow the reader to differentiate between conformance and interoperability testing,
- provide enough background information on the AFTN/AMHS Gateway specification in order to show the need and critical areas for its conformance testing,
- as a result of these requirements, elaborate a number of options for performing the conformance testing,
- make a number of recommendations concerning the options available.

Having demonstrated the need for the conformance testing of the AFTH/AMHS Gateway, the document aims to present the strategy recommended by the ACCESS Consortium.

1.3 Document Structure

The document is structured into three main chapters:

- Chapter 2 provides background information for the following two sections,
- Chapter 3 describes possible options for conformance testing the Gateway and
- Chapter 4 makes a number of recommendations on the approach to be followed.

The results of the work described here form a basis for further refinement in [A271].

1.4 References

Reference	Title
[A260]	WP260 Define Trials Objectives
[A261]	WP261 Define Operating Scenarios
[A262]	WP262 Produce Test Specification
[A263]	WP263 Produce Test Schedule
[A264]	WP264 Define Interoperability Test Tools
[A265]	WP265 Configure Trials Scenario
[A266]	WP266 Conduct ATSMHS Trials
[A270]	WP270 Conformance Test Requirements
[A271]	WP271 Conformance Test Specification
[ICAO1]	ICAO, Aeronautical Telecommunications Network (ATN), Standards and Recommended Practices (SARPs), Sub-Volume 3, Ground-Ground Applications, Version 2.2, January 1998
[ICAO2]	Guidance Material on [ICAO1]
[ICA16]	ATSMHS SARPs
[ICA17]	ATSMHS Guidance Material

2 Motivation for Conformance Testing

This chapter presents material on conformance testing and on the AFTN/AMHS Gateway itself as a background for the discussions in the other two main chapters.

2.1 Conformance versus Interoperability Testing

The top level document [A260] describes the overall strategy for ATSMHS testing within the ACCESS context. A distinction is made there among

- interoperability testing,
- conformance testing and
- reference testing.

In accordance with the major objectives of ACCESS Phase 2, Part 2, the emphasis in [A260] is placed on *interoperability* testing. Conformance testing is defined there as

> the exhaustive testing of a system under test against the functions and procedures defined in an agreed standard. A rigorous approach would test all the ‘shall’ and ‘should’ statements in the design specification.

As an extension of this definition, Table 1 is intended to show, in an informal way, the major differences between interoperability and conformance testing.

Table 1: Distinctions between conformance and interoperabiltiy testing

	conformance testing	**interoperability testing**
major goal of testing	demonstrate conformance with respect to specification	demonstrate capability of correctly interworking with other systems
scope of tests	as far as possible, all clauses of the specification (”shall” and ”should” statements) are tested	realistic interactions which could occur in a real network are tested
sequence of testing activities	normally performed on a system first	sensible only with systems which have already been conformance tested
other systems in test environment	dedicated, purpose-built test equipment	real production systems, possibly with test support equipment
number of systems involved	one system under test and testing equipment	system(s) under test and other comparable systems
distribution of test locations	can be performed locally between system under test and test equipment, e.g. in a laboratory	normally distributed over at least two remote locations
importance of incorrect protocol behaviour	handling of incorrect protocol behaviour by SUT is deliberately tested	only limited test possibilities are available because of the use of real systems

The distinction is illustrated in a schematic way in Figure 1. In the case of interoperability testing, the "other production systems" should ideally consist of parts of the real operational AFTN and AMHS.

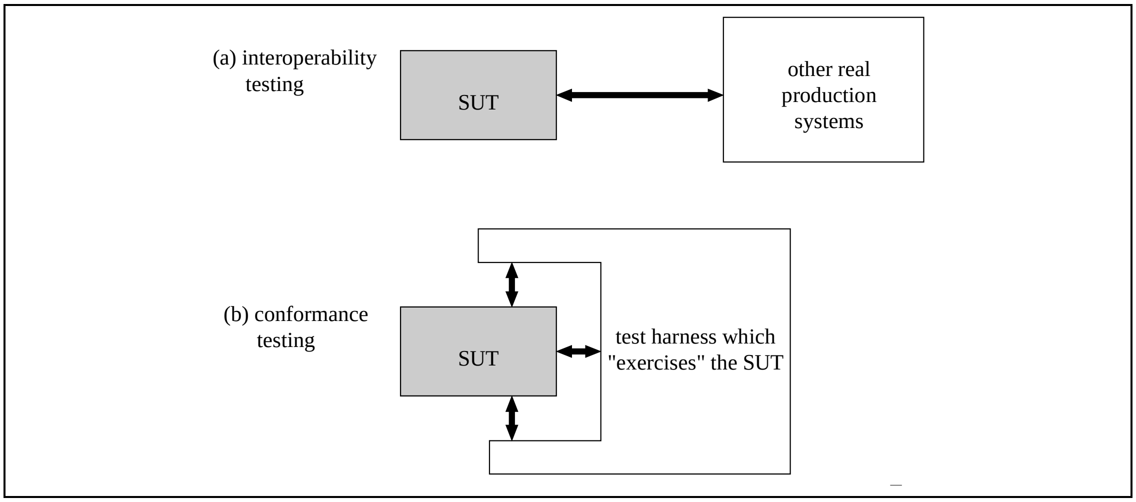

Figure 1: Schematic distinction between interoperability and conformance testing

It is clear that the type of testing performed during conformance testing is basically different from that of interoperability testing. In particular, in conformance testing

- some test sequences can be performed which would not be possible within the scope of interoperability testing, thus exercising the full scope of the specification,
- whereas performance and load testing are possible, at least in principle in interoperability testing, this is not usually considered in conformance testing which is restricted to the ”logic” of the protocol implementation,
- individual layers, components and interfaces of the SUT might be considered individually whereas this is never the case in interoperability testing.

It is argued in the following section that these test activities are not appropriate for the components of the AMHS in general but indeed for the AFTN/AMHS Gateway.

2.2 The Need to Perform Gateway Conformance Testing

Interoperability testing is appropriate for the testing of the AMHS components

- ATS Message User Agent and
- ATS Message Server

for the following reasons.

- Implementations of functions in these components are based on widely used, stable and mature specifications.
- It can be assumed that such implementations contain, as their major parts, standard protocol software packages which are already in operation in a number of different environments. Type approval resulting from formal conformance testing would normally exist as a precondition for the marketing of such packages.
- For the implementation of these two types of AMHS components, standard packages merely have to be tailored to the specific AMHS environment according

to standard profiles, as specified in [ICAO1]. The tailoring of standard packages does not invalidate type approval.

However these arguments do not necessarily apply to the AFTN/AMHS Gateway for the following reasons.

- The Gateway has been specified for the first time in [ICAO1] and represents a new set of functions.
- Implementations of the functions specified in [ICAO1] are being done by various manufacturers for the first time.
- No well-tried, established procedures exist yet for conformance testing and type approval of implementations of the AFTN/ATN Gateway.

Because of the fact that the specification in ICAO1] has not yet been implemented in full and validated in the field in real networks, it is likely that conformance testing might have some backwards effect on the specification. In similar cases it has been found in the past that whereas protocols have been implemented exactly according to the specification, this was not always what those writing the specification had in mind. Such discrepancies may come to light because the conformance test equipment would normally interpret the specification in the way it was originally intended.

Similarly it is inevitable that ”grey areas” in the specification only show up when implementations are taken into operation and this can lead to considerable wasted effort in network implementation and operation. If such grey areas had been identified and eliminated during conformance testing and before implementations were taken into operation, considerable effort could have been saved. For this reason, conformance test suites are usually subject for continued expansion as such areas are discovered.

In general, it can be stated that the conformance testing activity is very inexpensive in terms of effort when compared with interoperability testing and gives great benefits. This is due to the simplified logistics (testing in one, e.g. a laboratory location, instead of being distributed over several locations) and the use of dedicated equipment and well-defined test scenarios.

Since the late 1980’s, conformance testing has gone somewhat ”out of fashion” in the communication community. It was advanced in the 1980’ because of the completion of OSI network and application protocol suites and the recognition of the need for appropriate testing infrastructures. As a result, much effort was put into the definition of conformance testing strategies and test suites and into the setting up of conformance testing laboratories and the formalism for the issuing of type approval certificates. The effort and cost of these activities were generally underestimated. Together with the reluctance of manufactures to subject their products to conformance testing, this has led to a reduction in the amount of conformance testing currently taking place.

However the arguments made above in favour of performing conformance testing on new implementations of the AFTN/AMHS Gateway remain valid and the ACCESS Consortium recommends that this be done.

2.3 AFTN/AMHS Gateway

This section gives a very brief, informal description of important features of the AFTN/AMHS Gateway derived from the definition contained in [ICAO1] from the point of view of conformance testing. This is intended to provide background for the ensuing discussion.

The SARPs contain the following statement of the purpose of the Gateway:

> *An AFTN/AMHS Gateway shall provide for an interworking between the AFTN and the ATN such that communication with other AFTN/AMHS Gateways and with ATS Message Servers is possible.*

The Gateway is therefore seen to be a network element providing interworking between two different environments without any further end system (or end user) functions. Conformance testing of the Gateway must ensure that this interworking function is implemented correctly.

"Interworking" in this context implies that the network environment "hidden behind" the Gateway must appear to be compatible with the environment from which it is considered. This means that the AMHS infrastructure on the ATN, when seen via the Gateway from the AFTN, must appear to be part of the AFTN. Conversely, the AFTN, when seen via the Gateway from the ATN, must appear to be part of the AMHS. These characteristics are illustrated schematically in Figure 2.

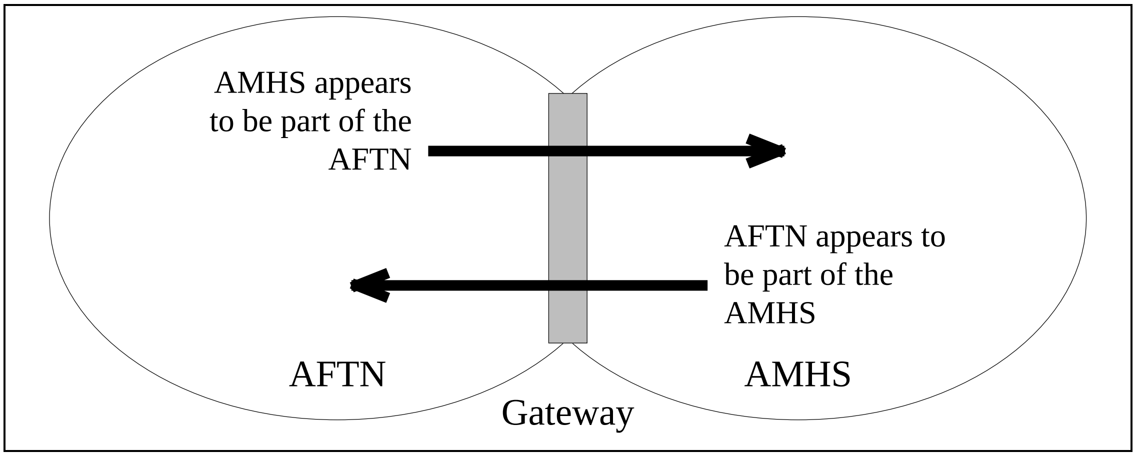

Figure 2: Representation of the Gateway functions from the two networks

More specifically: The Gateway is seen from the AFTN to be an AFTN Station connected to one AFTN switch. All AMHS users reachable by the Gateway are represented by AFTN users at this Station. Conversely, the Gateway is seen from the AMHS to be an ATN End System, an ATS Message Server, which is an Access Unit (AU) supported by a Message Transfer Agent (MTA). These two different views of the Gateway could also be from another AFTN/AMHS Gateway. Major general functions which are performed in the Gateway are address and message conversion together with traffic logging.

The view of the Gateway from the AFTN implies that the Gateway, with its own AFTN address, must satisfy the requirements of an AFTN Station according to Annex 10. This includes, for example, the requirements on recording and on the handling of service messages.

The view of the Gateway from the AMHS implies that the Gateway must satisfy the requirements of ATS Message Servers according to the standards and profiles used for their definition.

In addition, the Gateway must perform conversion functions and provide a control position which, however, are not "'visible" in these two views of it. This decomposition has lead to a logical structuring of the Gateway into four components as shown in Figure 3.

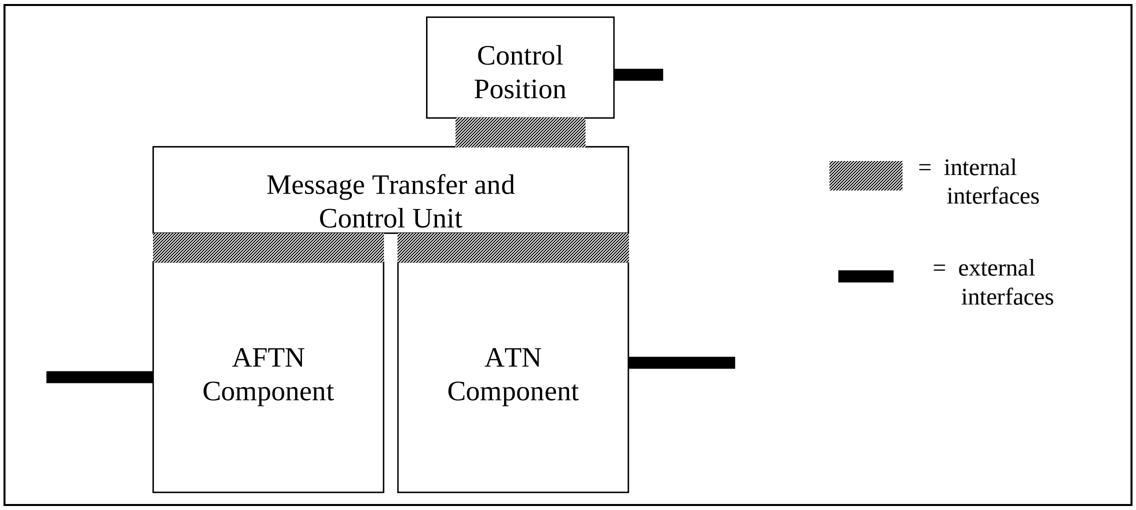

Figure 3: Logical structuring of the Gateway

The SARPs point out clearly that, although this is a convenient way to partition the Gateway for purposes of defining its functions, there is no requirement for the Gateway to actually be implemented in this fashion. This is important from the point of view of conformance testing because it means that there is no possibility of accessing the internal interfaces shown in Figure 3.

Figure 3 also shows the three interfaces at which conformance testing can take place; compare this with (b) in Figure 1.

The structuring of the Gateway in this fashion does, however, imply that the AFTN Component cannot simply be software identical to that in an AFTN switch. For example, only those messages received from the AFTN which could, in principle, be handled by the Message Transfer and Control Unit are actually passed on to it. Similarly, the Control Position is not specified in detail in the SARPs. It could, for example, be an intelligent system component implemented mainly in software or simply an interface to a human operator.

2.4 AFTN/AMHS Gateway SARPs

This section contains a brief overview of the AFTN/AMHS Gateway SARPs for the purpose of analysing the requirements to be placed on conformance testing suites.

The specification of the Gateway is contained within the ATSMHS SARPs which is part of ATN SARPs in Sub-Volume 3 (Ground-Ground Applications). Version 2.2 (January 1998) is assumed here, [ICAO1].

The SARPs distinguish between the "AFTN/AMHS Gateway" and a "Type A Gateway" providing a pass-through service without further recourse to messaging handling protocols. In keeping with the ACCESS strategy - see [A260], the Type A Gateway is not considered here.

The AMHS SARPs rely heavily on existing international standard protocols and on their international standard profiles. For this reason, the specification of the ATS Message Server - with the exception of the Gateway - amounts to only a very small volume of provisions (only a few pages). Additional functions which cannot be derived from the international standards are concerned with the IPM Message structure and with AMHS addressing.

More than 90% of the physical volume of the AMHS SARPs (Section 3.1.2) on more than 100 pages relate to the Gateway itself (Section 3.1.2.3). These are referred to here as the "Gateway SARPs".

It is important to note that the functions defined here are new and have not yet been subject to widespread implementation[1], let alone tested back-to-back across the ATN. This is certainly justification enough for proposing that implementations of the Gateway be conformance tested before they are introduced into real networks. A further justification for this proposal is the presence of functions such as priority handling which would be difficult, if not impossible to test successfully within the scope of interoperability testing.

Within the Gateway SARPs, those parts relating to the AFTN Component and to the ATN Component - see Section 2.3 - are also rather "thin" due to the fact that their functionality is defined elsewhere. (This fact, amongst others, well justifies the strategy followed in the SARPs of logically structuring the Gateway in this fashion.) The definition of remaining functions are concerned with general functions and with the way in which the components use the internal interfaces - see Figure 3.

It follows that the majority of the Gateway SARPs is dedicated to the Message Transfer and Control Unit, amounting to more than 90 of the 100 pages referred to above. They contain provisions for the processing of messages when being transferred between the AFTN and the AMHS components, mainly address and message conversion.

In particular, for the direction AFTN to AMHS (Section 3.1.2.3.4, 34 pages), conversions are defined for messages, service messages and acknowledgement messages.

Similarly, in the direction AMHS to AFTN (3.1.2.3.5, 58 pages), conversions are defined for IPMs, receipt notifications, non-delivery reports and probes.

These provisions for conversion in the Message Transfer and Control Unit can be tested effectively only within the scope of conformance testing (by comparison with interoperability testing). This is due to the combinatorially large number of cases to test and on the dependencies among the processing of message parameters. In principle, it should be the goal of conformance testing to investigate the implementation of each provision (effectively a "shall statement" in all its details). It will be decided in a subsequent document [A271] to what extent this is in fact feasible for the AFTN/AMHS Gateway.

[1] An exception is the Gateway implementation of AENA.

3 Conformance Testing Strategy Options

In this chapter, options open for use in the context of AFTN/AMHS conformance testing are surveyed in preparation for formulating recommendations in the following chapter.

3.1 Conformance Testing in other Contexts

An extensive "tradition" of conformance testing communication system implementations exists and should be taken account of for possible AFTN/AMHS conformance testing. Two types are reviewed briefly in this section.

3.1.1 Open Systems Interconnection

The subject matter of conformance testing was formalised and put into extensive practice in the context of ISO and ITU-T Open Systems Interconnection, OSI. This work gained momentum in the 1980s when a large number of standards matured and became stable. Extensive conformance testing methodologies and test suites for implementations of individual standards were defined, even a special language for the specification of test suites, Tree and Table Control Notation, TTCN.

The activity was also supported by the fact that many publicly funded projects came into being because it was felt that this was a typical task for public institutions such as the European Commission and that the setting up of infrastructure and procedures could not be expected from purely privately financed organisations. One of the goals within Europe was the possibility of issuing conformance certifications in one country which would be recognised in others.

Now, a decade later, it is apparent that, for a number of reasons, a lot of the momentum has left the conformance testing activity, for example,

- At the start, the effort necessary to define and perform conformance testing was highly underestimated. The costs involved in such a one-time activity can be difficult to justify when the decision-makers are not familiar with the cost savings which can result from effective conformance testing.
- Considerable resistance has come from manufacturers and suppliers of telecommunication equipment to submit their equipment to official conformance testing procedures. On the one hand, this would involve additional effort which did not immediately give a return on investment and on the other placed constraints on the implementations which made them more expensive.
- The amount of administrative overhead involved in performing tests and issuing certificates has proven to be unreasonable in many cases.

However within well-defined contexts, conformance testing remains an important activity. In particular, the OSILab and its accredited national testing laboratories, utilising results from a number of Commission projects remain active. The former PTT monopolies also maintain test laboratories which issue "type approval" certificates for equipment which is to be connected to "public" networks.

3.1.2 CIDIN

In a more specific environment and one which is closer to the ACCESS context, the experiences gained in the implementation of CIDIN are relevant here. To a certain extent, the introduction of new implementations of the CIDIN protocols in CIDIN Centres and

Stations show similarities with the implementation of the relevant SARPs in AFTN/AMHS Gateways:

- The specifications are relatively new and there is, as yet, no widespread basis of implementations.
- It is likely that future implementations will come from a number of different manufacturers.
- It is vitally important to demonstrate correctness and stability of the implementations before they are introduced into (existing) networks.

The European States taking part in the CIDIN Trials at the end of the 1980s decided to invest effort into the definition and execution of a conformance testing programme for all new implementations of the CIDIN protocols before taking part in the trials. Some of the generally agreed consequences resulting from this activity are:

- The implementation of CIDIN was thus significantly accelerated, its quality improved and costs reduced.
- The conformance testing activity highlighted "grey areas" in the specifications in a timely fashion.
- When difficulties due to protocol implementation arise in the operational network, the conformance test suites are extended accordingly, providing additional documentation of the interpretation of the CIDIN SARPs, and effectively ruling out the possibility that the same areas will cause network problems in the future.

The testing effort was supported by the existence of a de facto standard set of test equipment dedicated to the conformance testing of CIDIN protocol implementations.

3.2 Testing of Functional Components

In the context of conformance testing of protocol implementations, it is important to distinguish between the testing of complete systems ("black boxes") and the testing of individual protocol layers (in the sense of a layered protocol architecture), although the former can be seen as a special case of the latter. The distinction is illustrated in Figure 4.

In case (a) of Figure 4, only external interfaces which are part of the product are used for access by the conformance testing equipment. In case (b), on the other hand, the product has to be "opened up", providing access to individual layers. Depending on the methodology employed, a special software module, known as a "test responder" which is defined in the test suites needs to be located on the interface to the layer under test in order to simulate the layers above the one under test and to respond with prescribed protocol primitives and service data units. The test harness also needs an interface to the test responder in order to control it.

The situation shown in Figure 4 is relatively simple and the configuration for performing the conformance testing can, in fact, become quite complex. Apart from the definition of the test responder, an additional channel, using the same protocols as those in the SUT can be used for communications between the test equipment and the SUT. The test responder then becomes a "ferry" for conveying events at the service interface of the layer under test to and from the test equipment.

The conformance testing of CIDIN was performed on a layer-by-layer basis but without the use of a test responder.

These options need to be considered for the future conformance testing of the AFTN/ATN Gateway. In addition, the possible need to make the division of an AFTN/ATN Gateway SUT into its three main components - see Figure 3 - also needs to be considered.

An extensive conformance testing programme is currently being planned for implementations of ATN Intermediate and End Systems.

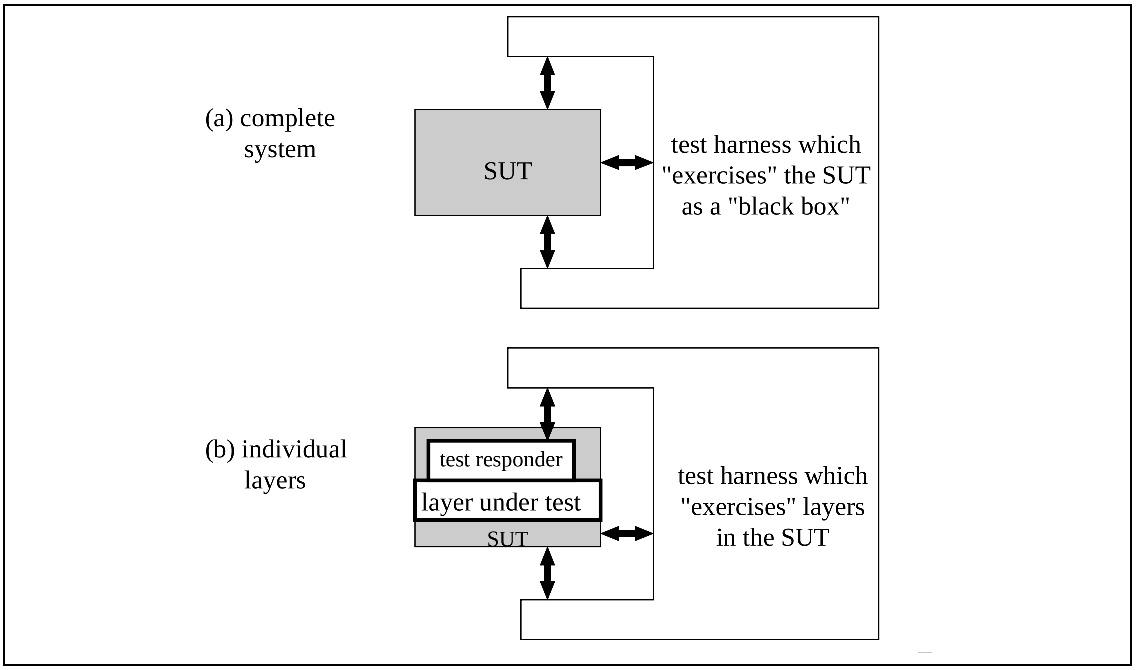

Figure 4: Schematic distinction between the conformance testing of complete systems and individual protocol layers.

3.3 Organisational Options

The organisational options open for performing the conformance testing of AFTN/ATN Gateway implementations range from formalised to informal, for example:

- setting up of a formal conformance testing body, possibly under institutional control,
- an industry-led organisation providing a de facto conformance standard,
- informal agreement among all participants involved in the implementation of Gateway on their conformance testing and co-operation on setting up the infrastructure and methods for performing it,
- no formal or informal agreements on conformance testing but the possibility of using the results produced, for example, by the ACCESS study.

These considerations raise questions such as the "ownership" of test methodologies and scenarios and the authority of any body performing the testing.

3.4 Equipment Options

Efficient conformance testing effectively assumes as a prerequisite the availability of dedicated, special purpose equipment tailored to the specific testing needs. In particular, the provision of the interfaces to the AFTN/ATN Gateway, the maintenance of the test suites in a database in the same form as specified and the presence of (certified!) implementations of

ATN/ATN Gateway software components are specific requirements. More generic requirements are the threefold separation of testing activities (setting up and test suite maintenance, test execution, test results evaluation), possibility for performing regression testing on new implementation releases and the generation of test reports.

However a number of options exist in this respect:

- To what extent should the test equipment be specified and who should do this?
- Should test equipment be procured by one central party (because of the rather small scale of the testing involved) or should this be left open?
- Should the implementation of test equipment be left to one manufacturer or should it be procured on the open market?

Recommendations on these and other questions are made in the following chapter.

4 Recommended Approach

As a result of the discussion in the previous chapters, recommendations on the approach to AFTN/ATN Gateway conformance testing are made in this chapter.

4.1 Overall Strategy

4.1.1 Organisational Arrangements

The conformance testing of AFTN/ATN Gateway implementations is a highly technical but rather small scale exercise due to the likely small number of implementations to be tested. For this reason, a pragmatic organisational approach needs to be taken. It is **recommended** that:

- the conformance testing methodology and the test suites as defined within the ACCESS Project be taken as the basis and possibly extended within the scope of projects involving all major European participants in this area; the agencies such as the European Commission which are the clients in such projects are effectively the owners of the project results;
- a mechanism be set up within the scope of projects referred to in the first point for extending the conformance test methodology and test suites based on experience with trial and operational networks;
- each participant, e.g. ATSO, is responsible for performing conformance testing on the Gateway implementations procured by him with a view to being introduced into the AMHS, and without involving further institutional arrangements; informal statements that conformance testing has been performed according to agreed procedures are necessary before Gateway implementations can be introduced into a trial or operational AMHS;
- as far as possible, participants aim to use common equipment and to share experiences which is documented within the scope of common projects (referred to in the first point).

4.1.2 Transparency of Components of the SUT

A number of options have been identified for the "transparency" of the Gateway SUT from the point of view of its conformance testing. On the basis of experience gained in comparable test environments, it is **recommended** that:

- the individual components of the Gateway (AFTN Component, ATN Component, Message Transfer and Control Unit) not be visible to the conformance testing equipment;
- (as a consequence of the first point) the individual protocol layers are also not visible;
- access to the Gateway SUT by the test equipment is only via standard AFTN and ATN network interfaces; the Control Position is not accessed by the test equipment on-line and is assumed to be a human readable terminal interface; during test runs, it has to be operated (in parallel with the test equipment) for configuring the Gateway extracting error messages, etc.

4.1.3 Availability of Test Equipment

Experience has shown that as much commonality in the test equipment used for different test runs should be aimed for. For this reason, it is **recommended** that:

- a pragmatic approach to defining test equipment be taken so that such equipment can be procured multiply for the different test sites, emphasising small size and low cost;
- the requirements specification for conformance testing equipment in this chapter be taken as a common basis by all participants and developed further within the scope of further common projects;
- for procurement of test equipment participants take as far as possible a common, agreed approach with respect to potential suppliers,

4.2 Tasks

This ACCESS WP is the first document discussing a possible future conformance testing of AFTN/ATN Gateway implementations. This section contains a short list of tasks which remain to be performed, most of them within the scope of projects common to all participants.

4.2.1 Refine Methodology

Some aspects of the recommended methodology are contained in this ACCESS WP. A refinement follows in WP271.

4.2.2 Specify Test Suites

A first draft of test suites (test case specifications) is derived from the relevant SARPs in WP271).

It is expected that the emphasis will be placed on conformance testing of the Message Transfer and Control Component of the Gateway: this is the major new part of a Gateway implementation and the other two components can be expected to be standard implementations and possibly have their own, existing type approval.

4.2.3 Create Requirements Specification for Test Equipment

According to organisational recommendations above, participants should aim at using common test equipment. This assumes the existence of a common requirements specification. A first high-level draft is contained in the following section. This needs to be refined by participants in ensuing common projects.

4.2.4 Procure Test Equipment

Using the common requirements specification, participants should procure, either individually or in co-operation, implementations of test equipment for ensuing conformance testing.

4.2.5 Perform Conformance Tests

According to the overall approach, conformance testing is performed by each participant individually.

4.3 Requirements on Test Equipment

As part of a common specification, this section provides a draft, high-level structuring of requirements which are to be placed on equipment for supporting Gateway conformance testing.

4.3.1 Functions

The software shall be designed such that the following three phases can be executed repeatedly and independently from one another:

- off-line phase consisting of test preparation and maintenance of test suites;
- on-line phase connected to the SUT in which tests are executed
- post-test phase in which test results are analysed and reports generated.

The functions available shall be appropriate to each of these phases taking into account the test suites specified which emphasise the testing of the Message Transfer and Control Unit component of the Gateway.

A common database system shall provide support to the functions. Multiple versions of database contents shall be maintained for different sets of test suites, test configurations and test results.

It shall be possible to repeat tests using the same configurations for regression testing.

4.3.2 Interfaces

The test equipment shall provide the following physical interfaces:

- one interface to the ATN Component simulating an X.25 subnetwork and all higher level protocols of an ATN End System required by [ICAO1],
- one interface to the AFTN Component simulating an asynchronous AFTN circuit at a rate of 9,600 bps according to the provisions of Annex 10,
- one operator terminal interface.

The possibility of transmitting contents of the database to other similar sets of test equipment may be provided as an option.

4.3.3 System Platform

The system platform used for implementing the test equipment shall be appropriate to the needs of conformance testing of a communications gateway.

The system platform shall be small in the sense that no other functions other than the Gateway conformance testing need to be performed at the same time.

Single-terminal operation shall be provided

There shall be no need to connect the system to other systems via networks in order to perform the functions specified here.

The system shall be portable and stand-alone.

As much as possible of the software supplied shall conform to industry standards.